The North Pickering Project

Planning for Urban Goods Movement
(A Background Report)

February 1975

Ministry of Housing
Ontario

This report was prepared as background material in the Planning of The North Pickering Planning Area and does not necessarily constitute a recommendation of the North Pickering Project nor approval of the Government of Ontario.

A
TRANSPORTATION
RESEARCH
REPORT

ON:

PLANNING FOR URBAN GOODS MOVEMENT

FOR:

THE NORTH
PICKERING PROJECT

February 1975

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CHAPTER 1

SUMMARY OF FINDINGS AND RECOMMENDATIONS

1.1 INTRODUCTION

This report results from a study of planning guidelines for urban goods movement for the proposed community of North Pickering.

The study:

1. investigated the goods movement industry,
2. reviewed goods movement planning, and
3. established planning and community criteria related to goods movement for North Pickering.

1.2 FINDINGS

1. From an operational aspect, the goods movement industry in Canada is highly fragmented and there is little coordination among operators of different freight movement modes.

2. The character of goods movement is not homogeneous. This is most noticeable in the commodities carried and the diverse locations of the origins and destinations of freight movement.

3. Goods movement in urban areas is dominated by trucks. It is estimated that trucks carry approximately 55% of all goods transported between urban areas and up to 95% of all goods carried within urban areas.

4. Of all truck trips made in an urban area, it is estimated that approximately 80% of the vehicle-miles travelled are by light trucks. About 5% are by heavy trucks (more than two axles). These percentages will vary depending on the particular sector under investigation.

5. The following illustrates a typical truck trip distribution by purpose. The figures have been rounded for simplicity.

Purpose	Per Cent of Truck Trips
Personal Use	10
Pick-Up and Delivery	58
Mail and Express	7
Construction	5
Maintenance	8
Business	5
Other	7
	100

However, there can be considerable variation from this depending on the size of truck.

6. A typical truck trip distribution by commodity is illustrated below:

Commodity	Per Cent of Truck Trips
Food and Farm Products	28.7
Pulp and Paper Products	1.7
Chemicals, Petroleum, Coal	4.7
Manufactured Items	15.3
Scrap and Waste	3.6
Tools, Equipment, Miscellaneous	23.1
Empty	22.9
	100

7. Residential and retail and wholesale areas are the predominant attractors of truck trips as shown by the following:

Land Use	Per Cent of Truck Trips
Residential	38.9
Manufacturing	6.3
Transportation, Utilities and Warehousing	7.1
Retail and Wholesale	25.4
Government	11.3
Other	11.0
	100.0

8. Ownership of trucks is widely spread; it is estimated that over 90% of the fleets contain fewer than 20 vehicles each.

9. Trucks spend an average of only 20% of a typical 12-hour day actually moving. The remainder of the time is spent loading and unloading. A considerable amount of time is spent waiting for other trucks to leave loading areas.

10. Up to 25% of all trucks on the road are empty. However, this is not unexpected since it is not always possible to ship suitable goods on the return portion of a truck trip.

11. Regulation of the trucking industry is not all-encompassing. The Province of Ontario regulates all trucking and trucking firms within the province except those operating entirely within local municipal boundaries. Firms operating locally are regulated by local bylaws only. Legislation permitting regulation of truck movements in urban areas is minimal. Under provisions of the Highway Traffic Act, a municipality can regulate only vehicles in excess of 50 feet in length.

12. The peak truck traffic in core business districts occurs typically from 10 to 11 in the morning with a secondary peak from 2 to 3 in the afternoon. As such, the peaks of truck trips in core areas do not coincide with personal travel peaks.

13. The rail mode is the second most predominant goods movement mode in urban areas next to trucks. Rail is often used for transporting bulk goods to industries and manufactured goods from plants to distribution centres.

Community and transportation problems resulting from the nature of goods movement today include:

1. The joint use of roads in core commercial areas by cars and heavy trucks for movement, parking, loading and unloading is common.

2. Local by-laws do not stipulate adequate facilities for truck loading and unloading as a part of the planning for new developments.

3. As a result of the above, curbside loading and unloading of all trucks is a common practice. The result is wasteful use of roadways, unnecessary traffic hazards and excessive delays for truck deliveries.

4. There is a substantial duplication of delivery services within an urban area. Separate deliveries of different goods are often made by many firms to one destination. The result is that many trucks operate at far from peak loads. Many trucks also carry full loads but are required to make many small delivery trips. Hence the truck operates at less than peak efficiency.

5. Trucks are primary contributors to traffic noise. Typical noise levels at 100 feet for trucks are 75dBA; the corresponding levels for cars are 55dBA. 45 to 55 dBA is generally considered a tolerable noise level for residential areas.

1.3 RECOMMENDATIONS

There are a number of significant factors which could contribute to efficient goods movement in North Pickering and which should be considered during the community planning process. These considerations are summarized as land use, transportation system, civic design, administrative and legislative recommendations.

1.3.1 Land Use

The land reserved for use by heavy industry should be well served by trunk transport services such as rail and trucking. Both modes are presently utilized for receiving and shipping bulk goods and for transporting manufactured goods to market areas. Light industrial developments including manufacturing, warehousing and offices should be adjacent to good road facilities. The majority of goods moved to and from such areas are presently moved by truck. Ideally, residential development should be well separated from industrial land uses. Residential land use should be located such that no major industrial based goods movement passes through it. Distribution terminals and central shipping and receiving areas should also be easily accessible to good road transportation. It is recommended that a consolidation terminal for incoming intercity shipments be located on the outskirts of the community and adjacent to freeway type facilities.

1.3.2 Transportation System

Ideally the system should provide for all commodities and all types of movements. The bulk quantity and long distance shipping of industrial based goods are generally served by rail and truck. The transportation system should reflect this. Intracity pick-up and delivery trucking is the prevalent mode for serving lighter type industry. Therefore, adequate road facilities should be provided between this type of land use and warehousing and distribution centres. Residential areas can be satisfactorily buffered from transportation facilities by light industrial development.

1.3.3 Civic Design

In densely developed areas such as central business districts, there should be a physical separation of goods movement traffic from pedestrian and other personal travel patterns. At-grade separation is possible but early planning can facilitate the more desirable vertical separation. It appears that light truck travel is presently not objectionable on local type residential streets and will not become objectionable in the future. Vertically separated goods movement by road may be made compatible with goods movement by rapid transit. Early planning in terms of line and station location and station and vehicle design is strongly recommended if goods movement by rapid transit is anticipated. Underground facilities for solid waste disposal are feasible. However, at present, economic considerations make this system questionable.

1.3.4 Administrative

Consolidation of shipments of small size and large number of pieces is recommended. Furthermore, it seems beneficial to concentrate the authority over urban trucking movements in one government agency. This agency should be the operator of the

of the consolidation terminal and the local pick-up and delivery service between the terminal and strategically located central shipping and receiving areas. The latter can be planned to serve one or a group of adjacent buildings. The agency should assume control over private intracity trucking as well as for hire trucking since this constitutes by far the majority of urban trucking. It is felt that intercity trucking and distribution from central receiving areas to final destinations could continue to be done privately.

1.3.5 Legislative

It is recommended that further study be carried out to determine proper requirements for the number of truck bays, storage areas and the amount of manoeuvering space. Present requirements by other municipalities are generally not sufficient. It is also recommended that Provincial legislation be enacted to allow municipal control over truck combinations of less than the present 50 feet in length. This would facilitate local planning to minimize disruptive effects due to trucks.

CHAPTER 2

URBAN GOODS MOVEMENT TODAY

2.1 INTRODUCTION

2.1.1 Identification of Goods Movement

Goods movement is commonly defined to be the movement of all commodities except fresh water and sewage, by any or all of the following modes; truck, rail, water, air and pipeline. The transport of petroleum and coal always constitutes goods movement. Natural and manufactured gas are only considered when they are liquefied and moved by truck or rail. Power transport, normally, does not constitute goods movement or commodity flow.

The most obvious and noticeable characteristic of goods movement is its variability in all forms - the commodities transported, the modes used, the methods of handling, and the purposes and the types of trips. In addition, the nature and the location of the many freight origins and destinations, together with the involvement of both public and private agencies make for a complex system.

2.1.2 The Dominance of the Trucking Mode

The modal choice in goods movement is affected by numerous factors including the commodity type, the value and bulk of the shipment, the number of pieces comprising the shipment, the total cost of movement, the length of the trip and the nature and location of the origin and destinations.

In urban areas the truck has assumed a dominant role. It provides several advantages over other modes including, flexibility, convenience, and door-to-door service.

According to the Tri-State Transportation Commission (9)* in the United States, the trucking mode accounts for 73% of the tons, 45% of the ton-miles, and 97% of the (total urban) shipping expenditure.

In addition to freight movement and person transport, trucks also provide local pick up and delivery services, repair services, and garbage and waste removal. Such extensive use results in considerable truck traffic and presents a congestion problem to both motor carriers and other road users. The conflict is especially noticeable in downtown and core areas where poor docking facilities result in loading or unloading at the curbside, and double-parking. The air and noise pollution in downtown areas, is also further aggravated by the amount of traffic.

2.1.3 The Nature of the Industry

A distinct feature of the goods movement industry is the existence of an extremely large number of private operators, each of whom operates a small fleet of trucks. More than 90% of the trucks in the United States are in small fleets of 20 trucks or less (1). A similar percentage presumably exists for Canada.

A second major characteristic of the industry is the significant involvement of the government as both an operator and a regulator. Government operating activities include the movement of mail and garbage removal. Government regulation is carried out at two levels. The Province regulates intercity freight carriers and

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** Numbers in parenthesis refer to the information source.*

individual Municipalities control local delivery firms.

The large number of independent operators, both public and private, has in the past resulted in a lack of coordinated planning.

2.1.4 Urban Goods Movement and the Community

An efficient goods movement system provides the total community with certain benefits. It allows industry to locate in areas other than the core. It reduces the amount of inventory needed in warehouses, and it affects the retail price of consumer goods in a positive manner. At present, it is estimated that transportation accounts for 20% of the total consumer cost (2).

Every effort should be made to coordinate the goods movement industry so as to create a balanced system and provide the community with all potential benefits. One viable strategy includes the consolidation of shipments and terminals, to reduce duplication of service, and to achieve certain economies of scale in the industry.

2.2 THE NATURE OF FREIGHT MOVEMENT

Freight movement is difficult to describe. There exist many possible methods of measurement. Common classifications include weight, size of shipment and commodity type.

Freight movement can also be classified into intercity and intra-urban shipments. Intercity movements are those that enter, exit or operate through an urban area and intra-urban are those that originate from and are destined to places within one urban area. These two categories of freight movement can be significantly different in character, mode, commodity and their effect on the community. Both types of movement can be expected in an urban area

such as North Pickering and will be further discussed in the next two sections.

2.2.1 Intercity Freight Movement

The modes used for moving intercity freight depend on the nature of the load and on the location of the area. The Tri-State Transportation Commission cites the following distribution, for a particular study area, 76% of the tons and 36% of the ton-miles are carried by trucks, and 11% of the tons and 29% of the ton-miles are carried by rail. Throughout Canada, the truck's share of the tons and ton-miles are approximately 55% and 10% respectively (3). Moreover, it is estimated that the transportation industry in Canada (excluding private trucking) contributes over 7% to the Gross Domestic Product (3).

As mentioned earlier, trucking is attractive because of its ability to provide door-to-door service without transfer. The rail mode, however, also provides certain advantages, particularly when transporting bulk materials over long distances. Rail service to and from industrial plants is common. Raw goods can be shipped to the plant and manufactured goods can be transported from the plant to market areas.

It is estimated that intercity truck trips constitute 30% of all truck traffic. Intercity truck trips typically use heavy trucks and often travel between terminals located on the outskirts of urban areas. Often these trucks are loaded during the day and drive during the night. Typically, the commodities carried will be agricultural and dairy produce and manufactured and semi-manufactured goods. It is generally estimated that the intercity private and "for hire" operations are about equal in volume. The characteristics of intercity trucking will again vary with the specific areas and their functions. Depending on the nature of

the community and the amount and type of its industry, most of the above comments should apply to the New Town of North Pickering.

2.2.2 Intra-Urban Freight Movement

The choice of mode used within an urban area depends mainly on the type of commodity, the level of service, and the total cost of shipment. Presently the truck is best able to provide most services.

a) Types of Trucks

Trucks used in urban freight movement are generally divided into three categories; light, medium and heavy. Light trucks are equipped with two axles and four tires. Typical examples include delivery vans and light pick-ups. Medium trucks are equipped with three axles and six tires; dump trucks and local general delivery trucks are included in this category. The third category, heavy trucks, includes those with more than two axles; heavy single unit trucks and multiple unit trucks are typical examples.

Urban truck traffic is dominated by the light truck. The extent of its dominance is shown clearly in Table No. 1. The reason for the large number of light trucks is that this type of truck is often used as a dual purpose vehicle. The presence of light trucks is considered important in today's transportation studies because these vehicles behave in a similar manner to passenger cars and do not have the disturbing affect upon traffic flows that larger trucks have.

Light trucks only present problems to automobile and pedestrian traffic when they are parked in non-designated areas. As mentioned previously, this often occurs in the downtown and core areas.

Most urban trucking is carried out by private firms. Only about 8% of the commercial vehicles registered in Toronto, for example, are licensed to move goods for hire (4).

TABLE NO. 1

TYPICAL DISTRIBUTION OF TRUCK TRAFFIC IN AN URBAN AREA

	Percent by Type of Truck		
	Light	Medium	Heavy
Daily Trips	78	17	5
Daily Vehicle-Miles	82	15	3
Daily Tons Carried	21	46	33
Daily Ton-Miles	26	51	23

Source: Baton Rouge Metropolitan Area Transportation Study, Wilbur Smith and Associates, 1967.

b) Trip Characteristics

In the United States, it has been estimated that 75% of intracity truck trips are made by light trucks (1) and that the average trip length for light trucks is 1.6 miles. Table No. 2 illustrates a typical distribution of truck trips by purpose. The extent of personal use is apparent. Further, it should be noted that only one-half of all truck trips transport cargo (1).

A distribution of truck type by trip purpose is presented in Table No. 3. The dominance of light trucks, (i.e. pick-ups and vans) is again noted. In a 24-hour period, the average truck is only in motion for about three hours. Even over a twelve-hour day, this only amounts to 21% of the time. A significant portion of time is spent loading, unloading, and waiting for authorization.

The dominant land-use category for both producing and attracting truck trips is residential. In American urban transportation studies, approximately 40% of truck trips either originate from or are destined to residential areas and approximately 25% either originate from or are destined to retail and wholesale trade areas. Government, manufacturing, transportation, utilities, warehousing, and other land-use types each produced or attracted 10% or less of the total trips. The distribution of urban truck trips by type of land use is shown in Table No. 4. As might be expected, land uses differ in truck trip generation rates and trips by type of truck. Table No. 5 clearly shows this variation.

Truck traffic generation rates in terms of population, acres of land and square footage of floor area have been determined by some studies (1, 5) as summerized in Table 6.

City-wide trip generation rates have been found to range from 0.6 to 3.5 truck trips per acre. By land-use type these rates are 1.0 to 2.0 truck trips per acre of residential land use and can be anywhere from 10 to 35 truck trips per acre in commercial areas. Similarily, 95 to 120 total truck trips can be expected in urban areas per 1,000 population. Pick-ups and deliveries can range between a third and one-half of the rate for total truck trips.

A summary of suggested generation rates is given in Table 7.

TABLE NO. 2

PERCENTAGE DISTRIBUTION OF URBAN TRUCK TRIPS BY PURPOSE

Purpose at Trip Destination		Percentage of Total Daily Trips
Personal Use		10.0
All Pick-up and Delivery		57.4
Retail	25.5	
Wholesale	24.3	
Merchandise	7.6	
Mail and Express		6.9
Construction		5.2
Maintenance and Repair		8.0
Business Use		5.0
Other		6.6
All Purposes		100.0

Source: Motor Trucks in the Metropolis, Wilbur Smith and Associates, 1969.

The presence of trucks on roadways is less prevalent during the peak hours, for two reasons. First, many deliveries must be made during business hours and second,road congestion is often so severe during peak hours that trucking costs would be prohibitive. Furthermore, medium and heavy trucks can be very disruptive to traffic flows, and even a small heavy truck volume can be objectionable.

The impact of urban trucking varies considerably in various portions of the community. A small concentration of delivery and other light trucks is usually not objectionable in residential areas. However, concentrations of light and medium trucks with some curbside loading and unloading may be very disturbing in core business areas.

c) Commodities Handled

The commodities carried vary with the types of truck as would be expected. This is tabulated in Table No. 8. Light trucks carry 56.7% of all products and 82.5% of all tools, equipment and miscellaneous and they constitute 78.9% of all empty truck trips.

TABLE NO. 3

PERCENTAGE DISTRIBUTION OF TRUCK TYPES

BY TRIP PURPOSES

Trip Purpose	Type of Truck Per Cent		
	Light	Medium	Heavy
Personal Use	96	4	0
Delivery Pick-up	58	38	4
Mail Express	86	13	1
Construction	61	30	9
Maintenance Repair	81	18	1
Business Use	82	14	4
Aggregate Mean	66	29	5

Source: Motor Trucks in the Metropolis, Wilbur Smith and Associates, 1969.

TABLE NO. 4

PERCENTAGE DISTRIBUTION OF TRUCK TRIPS

BY TYPE OF URBAN LAND USE

	To Land Use						
	Residential	Manufacturing	Transportation	Retail	Government	Other	Total
From Land Use							
Residential	24.1	2.4	1.7	6.1	3.5	3.1	40.9
Manufacturing	2.2	1.5	0.6	1.8	0.9	0.7	7.7
Transportation, utilities, warehousing	1.5	0.6	0.7	2.4	0.4	0.8	6.4
Retail-Wholesale Trade	7.9	2.0	2.4	9.0	2.5	2.8	26.6
Government	4.3	1.1	0.6	2.8	1.9	1.4	12.1
Other	2.1	0.6	0.2	1.5	0.6	1.3	6.3
Total	42.1	8.2	6.2	23.6	9.8	10.1	100.0

Source: Motor Trucks in the Metropolis, Wilbur Smith and Associates, 1969.

TABLE NO. 5

DISTRIBUTION OF INTRA-URBAN TRUCK TRIPS*

BY LAND USE AT DESTINATION AND TRUCK TYPE

	Type of Truck			
	Light	Medium	Heavy	All
Land Use				
Residential	43.9	30.7	11.9	38.9
Manufacturing	4.4	8.6	23.3	6.3
Transportation, Utilities Warehousing	5.7	8.4	20.8	7.1
Retail and Wholesale Trade	23.1	32.1	16.5	25.4
Government	12.3	8.6	13.0	11.3
Other	10.6	11.6	14.5	11.0
Total	100.0	100.0	100.0	100.0

Source: Motor Trucks in the Metropolis, Wilbur Smith and Associates, 1969

** Results do not correspond exactly with those in Table 4 because of a change in the data base.*

TABLE NO. 6

TRUCK TRAFFIC GENERATION RATES IN CORE AREAS

BY LAND USE

Land Use	Average Number of Truck Trips Generated Per Gross 1,000 Square Feet of Floor Area
Manufacturing	0.68
Warehousing	0.53
Office	0.22
Department Store	0.24

Source: Goods Movement by Truck in the Central Area of Selected Canadian Cities, Malcolm V. Bates, 1970.

TABLE NO. 7

TRUCK TRIP ATTRACTION FACTORS FOR

RESIDENTIAL LAND USE

Variable	Truck Trip Rates Per 1,000 Population
Population Density (person per acre)	
0 - 10	120 - 160
10 - 25	95 - 125
25 +	65 - 90
Dwelling Unit Density (D.U's per acre)	
0 - 3	110 - 160
3 - 10	100 - 115
10 +	60 - 90
Above Average Income	110 - 135
Below Average Income	85 - 95

Source: Motor Trucks in the Metropolis, Wilbur Smith and Associates, 1969.

TABLE NO. 8

PERCENTAGE DISTRIBUTION OF TRUCK TRIPS

BY COMMODITY AND TRUCK TYPE

Commodity	Per Cent by Truck Type			
	Light	Medium	Heavy	All
Food and Farm Products	23.1	44.7	12.6	28.7
Pulp and Paper Products	1.6	2.0	2.7	1.7
Chemicals,Petroleum, Coal	3.4	6.7	12.0	4.7
Manufactured Items	16.2	12.3	20.0	15.3
Scrap and Waste	0.9	8.5	14.0	3.6
Tools, Equipment, Miscellaneous	28.2	12.6	12.2	23.1
Empty	26.6	13.2	26.2	22.9
All Commodities	100.0	100.0	100.0	100.0

Source: Motor Trucks in the Metropolis, Wilbur Smith and Associates, 1969.

2.3 REGULATION OF CARRIERS

2.3.1 Regulation by the Province

The Province of Ontario regulates the "for hire" trucking industry with the exception of local cartage firms operating entirely within municipal boundaries. The Province through the Ontario Highway Transport Board grants two types of licenses: the Public Commercial Vehicle Operating License and the Public Commercial Vehicle License. In this way, both the operators and the vehicles are controlled.

The operating license is issued by the Board when the service proposed is thought to be necessary and supportable by the market. The license allows the operation to use licensed public commercial vehicles on

Provincial highways for the transport of freight. It may limit the operation to specific services, routes and market areas. The type of goods that may be transported is also determined by the type of license and therefore carriers will generally hold more than one type of license.

The Public Commercial Vehicle (P.C.V.) license is necessary for each vehicle used by licensed "for hire" carriers. The vehicles are classified according to the type of licenses held by the operators. The fees charged for the licenses are based on vehicle gross weights.

2.3.2 Regulation by the Municipality

Municipalities may control truck travel within their boundaries by several means:

a) The Highway Traffic Act permits a municipality to restrict trucks greater than 50 feet in length from using municipal streets.

b) The Municipal Act permits a municipality by means of a by-law and proper signing to designate certain routes as "no-truck" routes. This is often referred to as "negative" truck routing control.

c) Also by provision of the Municipal Act a municipality may designate and sign certain routes as truck routes and restrict truck traffic from using all other routes. This is typically referred to a "permissive truck" routing control.

2.4 LABOUR CONSIDERATIONS

Because the goods movement industry is so highly fragmented, the extent of unionized labour may not be excessive. However, the industry is highly labour intensive and measures taken to streamline the industry may conflict with present labour agreements and union aims. Indications are that many possible modifications to present procedures are acceptable to the Teamsters Union. However, further planning and finalized schemes should have considerable input from the appropriate union leaders.

2.5 TODAY'S PROBLEM AREAS

2.5.1 Conflict with Person Transport

Truck transportation especially in the form of heavy trucks is disruptive to the movement of cars. Trucking is most often a nuisance to car drivers in central or commercial areas where major demands exist for the same right-of-way. Trucks often hinder the flow of traffic by parking illegally along the curb to load or unload. Inadequate numbers of trucking bays often results in curbside unloading and disruption to pedestrian traffic. In severe conditions, pedestrians may even be forced onto the road.

2.5.2 Lack of Adequate Shipping and Receiving Facilities

Local by-laws do not stipulate adequate requirements for off-street loading. One recent study (6) estimates that requirements within the downtown core should be three or more times what they are listed at presently. It is also necessary that the truck bays be properly designed to facilitate goods handling. The docks should be sufficiently wide and high and should provide adjacent storage area for the goods. Furthermore, adequate facilities should be provided for truck manoeuvering and truck parking needs when all bays are in use.

2.5.3 Duplication of Service

There are a myriad of companies providing essentially the same services and it is not uncommon for trucks from different companies to arrive simultaneously to make a delivery; each being only partially loaded. It seems that some integration of service would be a benefit to the community. It has been suggested that an area or even a large development should have central shipping and receiving areas. These are especially beneficial for light shipments. Better goods handling techniques may be necessary to accommodate incompatible commodity types.

2.5.4 Timing of Deliveries

Urban goods movement traffic presently peaks at about 10 - 11 in the morning with a secondary peak at about 2 - 3 in the afternoon. Although these peaks do not correspond with those of person travel, they do create problems since many deliveries are concentrated into short time periods. Night time deliveries have been suggested and have in fact been tried in England with little success. Shop owners were either unwilling to be present themselves after shop hours or did not wish to pay help for the extra time. One recent study concluded that night time deliveries would be more expensive if increased cost to the receivers was included (2).

2.5.5 Environmental Effects

Most environmental impacts due to trucking are negative. Table No. 9 compares the pollution emission per ton-mile of movement by various modes. Truck movement is seen to be a significant contributor to air pollution.

Noise pollution is primarily evident in residential areas through which trucks must move, and results only from poor planning. Proper use of industrial land as buffer zones can help to eliminate the problem. The sound levels generated by truck traffic are dependent on many variables and it is difficult to generalize. However, the following comments can be made regarding truck movement as a source of noise pollution. The noise generated varies with the number of trucks but not with their speed. Raising or lowering the roadway does decrease the amount of noise at a given distance away from the roadway. Lowering the roadway seems more effective in noise reduction. The single most effective method of reducing noise is to isolate the source. Due to the logarithmic nature of noise loudness, however, a doubling of distance is required to reduce the loudness by a constant amount.

TABLE NO. 9

POLLUTION EMISSION BY VARIOUS GOODS MOVEMENT MODES

Mode	Cubic Feet of Pollution Emission per Million Ton-Miles of Movement
Road - Diesel	77,100
Road - Gasoline	1,250,000
Rail - Diesel	23,100
Water- Diesel	17,800

Source: Existing Transportation, Part 2: Existing Freight Movement Systems, Metropolitan Toronto Transportation Plan Review, 1972.

CHAPTER 3

GOODS MOVEMENT PLANNING IN OTHER COMMUNITIES

3.1 INTRODUCTION

Goods movement planning is still very much in its infancy. Urban transportation planning for person travel has progressed significantly in the last twenty years and although it was always recognized that goods movement was an integral part of urban transportation, serious work in this area was rarely done. The main reason for this is probably the high cost involved, and a tremendous amount of preliminary data collection work must be done before any serious planning work can commence. Furthermore, peak hours of goods movement do not coincide with peak hours of person travel. Thus, perhaps, less emphasis was placed on planning for goods movement. Several ongoing urban transportation studies have recently commenced work in goods movement; most notably the Tri-State Transportation Commission in New York and the Chicago Area Transportation Study. These are comprehensive goods movement planning efforts covering all modes. A number of studies also have been done which were specialized in nature dealing with only specific modes, commodities or components of the goods movement system. A freight terminal study for St. Louis is an example.

3.2 EXISTING GOODS MOVEMENT PLANNING

The Tri-State Transportation Commission of New York has initiated goods movement planning as part of a continuous transportation planning study. To-date, this study has collected data concerning all freight movements into, out of and within the region. This phase is the first step toward planning for future freight movements.

The Chicago Area Transportation Study (CATS) began its goods movement planning by compiling a detailed inventory of goods movement related facilities in the form of an atlas. CATS has completed some significant work based on this inventory. Some preliminary recommendations have eminated from these studies including:

a) Railroad rights-of-way and yards are often a duplication and should be consolidated. This would make a significant amount of land in the urban area available for better use.

b) The number of piggyback terminals should be reduced.

c) Certain corridors should be reserved for goods movement by certain modes and for certain industries.

d) Water routes for both recreational and commercial crafts should be modified.

e) A central area distribution system should be considered. This system would include a central consolidation area in the dense core, an underground distribution system and subterminals.

The East-West Gateway Co-ordinating Council of St. Louis studies urban goods movement in terms of freight terminals. It was found that truck terminals function as collection and distribution terminals and as interline transfer, a transfer of freight from one carrier to another point. In the former function, the terminal acts as the interface between the long haul, over-the-road trucking operation and the local pick-up and delivery operation.

There is a wide range of published information about other aspects of goods movement. A number of sources deal with data collection and its difficulties. Other studies examine present-day problems and suggest possible improvements. One recent study has gone as far as making economic comparisons of several possible strategies including:

a) terminal consolidation,

b) shipment consolidation,

c) reducing travel time with daytime deliveries,

d) reducing travel time with night deliveries, and

e) reducing the unloading time.

The consolidation of terminals may reduce the number of terminals required but may also increase the driving time of some trucks. In all probability, long haul vehicles may save travel time while pick-up and delivery vehicles may increase travel time.

Consolidation of shipments should decrease the cost of goods distribution. Savings in cost can be obtained in terminal operations, the actual delivery process and the receiving of goods. However, consolidation of deliveries is presently dependent on the size of the shipment. It was found that shipments of over 1,000 pounds could be more economically shipped directly. With possible better goods handling techniques in the future this may change.

Reducing travel time through improvements in the level of road congestion does not reduce the cost of urban goods movement significantly. The reason for this is that trucks today are not moving during a large portion of an average day.

Reducing travel time through nighttime deliveries will not offset the increasing cost incurred by the consignees by having to arrange for receiving the goods.

Reducing truck loading/unloading time is the single most effective technique of reducing urban goods movement cost. Improved goods

handling methods include off-street loading bays, truck-level docks or dock levelers, forklifts, and power conveyors.

The estimated change in cost by implementing the above options are given in Table No. 10.

TABLE NO. 10

COST COMPARISON OF ALTERNATIVE
URBAN GOODS MOVEMENT STRATEGIES

Strategy	Percent Change in Cost from Base Conditions
Terminal Consolidation	- 4
Shipment Consolidation	-17
Reducing Travel Time - Daytime	-13
- Nighttime	+24
Improved Goods Handling	-26

Source: Urban Goods Movement - The Key to Improved Transportation Productivity, John H. Marino, Transportation Research Forum, 1973.

Several studies have investigated new technology for future urban goods movement. The Centralsug system initially introduced in Sweden and more recently constructed in Walt Disney World in Orlando, Florida seems an attractive alternative to traditional labour intensive solid waste disposal. Similarly, a pneumatic tube household goods distribution system proposed for the new town of Etarea, Czechoslovakia may eventually be acceptable. The Canadian Transport Commission has suggested two systems for urban goods movement both using concrete "sewer" pipes of about six feet in diameter. One system is essentially a container system while the other uses freight packages banded together. Both employ powered roller conveyors. These systems will be discussed further in the next chapter.

Information also exists concerning demand forecasting. These range from freight generation analysis and market studies to input-output models.

3.3. THE STATE OF THE ART

Urban goods movement has long been neglected in urban transportation planning. The studies that have been done in this area were often designed to analyze a specific problem which usually did not relate to problems in other areas. Traditional urban transportation planning studies have rarely dealt with goods movement in a satisfactory manner. Usually, some problems were identified, however, little attention was given to the entire complex system. As a result, very little information is presently available. There is no data base to start with. No theory, model or even standard methodology for future planning studies. Furthermore, there is no basis for comparison and none for projecting historical trends. Data concerning the variation of goods movement over time is practically non-existent.

Based on the literature research conducted for this study, some phases or urban goods movement can be identified where early planning can reduce costs and other disbenefits in a new town.

The area of greatest and most radical change can be in the organizational structure of the industry. Consolidation of shipments and conducting urban pick-up and delivery through only one agency will improve the efficiency of the process considerably. This strategy may still be unfeasible.

Well designed and sufficiently large facilities for shipping and receiving goods will also reduce transport costs. Central shipping and receiving areas serving one or more buildings should be mandatory. The number of trucking bays and the amount of space needed for vehicle storage and manoeuvering should be established and implemented through legislation.

The land use allocation process has important implications on the urban goods movement system. Efficiency in goods transport will be more easily achieved through well planned land use allocation. Further, proper land use allocation will reduce adverse environmental impacts significantly.

There are indications that new means of urban goods movement may be feasible. New systems based on improved technology should contribute to less disruptive urban freight movement.

All of the above considerations are discussed in detail in the next chapter.

CHAPTER 4

PLANNING CONSIDERATION FOR URBAN GOODS MOVEMENT

4.1 FUTURE TRENDS IN GOODS MOVEMENT

a) Urban Movement

The variability of goods movement operations, practices and facilities has been stressed throughout this report. This variability in commodities and type of handling and especially in its many possible origins and destinations dictates a very flexible goods movement system. Even if a significant consolidation of shipping and receiving areas occurs, the goods movement system should be flexible and operate in individual units. Although the possibilities exist for future innovations in urban goods movement, no system being discussed today is versatile enough to entirely replace urban trucking.

b) Intercity Movement

Pipeline transport has become increasingly attractive recently due to its extremely low labour cost component. Similarly, air freight has grown disproportionately because faster shipments mean quicker turnovers and therefore lower investment in inventory. It is anticipated that rapid growth in goods movement by these modes will continue.

There are indications today that the cost of goods movement will rise disproportionately to manufacturing costs especially because of the rising costs of energy. If this trend continues it is possible that industry and retail establishments will invest in greater inventory space. This may make goods transport more efficient by reducing the number of shipments needed to serve the establishment. However, this may result in a reduced market

for the operators (most of whom operate privately) and in turn an increase in rates to maintain present levels of profit. In a similar manner, the use of warehousing-retail areas may become more prominent. These may become very popular because they reduce the actual selling cost as well as the goods transportation cost.

4.2 POTENTIAL TRANSPORT MODES FOR GOODS MOVEMENT IN NORTH PICKERING

4.2.1 Trucking Mode

The advantages of the trucking mode over other modes in certain instances are obvious. Trucking is dominant because it can offer flexible, door-to-door service, without transfer in an urban area. As a result, even if person travel by automobile is minimized in North Pickering, road facilities must be provided for trucking. However, proper planning of land use and use of shipment consolidation procedures can minimize the number of truck trips and their resultant negative effects.

4.2.2 Rail Mode

The use of rail for goods movements is presently mainly confined to intercity movements. The location of rail facilities is fixed and freight pick-up and deliveries by other modes are only economical for long distance movements. The rail mode may be utilized for intracity goods movement in the future, however, if major freight generators can be concentrated along rail facilities.

4.2.3 Rapid Transit Mode

Existing rapid transit systems possess many characteristics that do not lend themselves to the movement of freight. First of all the design and interior layout of present subway cars is not suitable for goods delivery. Similarly, the design of subway

stations and their means of access are also not conducive to goods handling. Finally, the location of present rapid transit lines and stations are usually determined without regard to points of freight movement demand. However, all of the above considerations might be at least partially overcome when planning a new system.

With early planning, it may be possible to utilize public transit system for some urban goods movement during the off-peak hours in North Pickering. However, to develop such a system would require a great deal more investigation. Off-line tracks and other special facilities probably would have to be provided. Transit operators would have to be consulted to ensure that necessary operations and maintenance could still be performed. The need for early planning input is essential. It would be very difficult to adapt existing rapid transit systems to goods movement.

4.2.4 Potential New Systems

Several new systems for future urban goods movement have been recently proposed. Of the four proposals considered, only one has been tested; the other three are merely at the concept stage.

A pneumatic-tube system to distribute household type goods has been proposed for Etarea, a new town in Czechoslovakia. This system is planned to connect to each home and is envisaged to distribute household articles including groceries, medicines, cosmetics, newspapers and mail deliveries. The container utilized would be cylindrical in shape with dimensions of approximately 16-inches in length and 8-inches in diameter.

The Canadian Transport Commission has suggested two systems utilizing powered rollers or conveyor belts inside concrete pipes approximately six feet in diameter. One system is a container based system and with the other, freight is shipped in loose packages or can be banded together. The paper in which these proposals are made does not discuss the nature of the freight, its origins and destinations, or the economics of the system. The systems are technically feasible, however, other considerations are undoubtedly more critical to such a system's success.

The final system considered is a solid waste removal system called Centralsug. This system was first introduced in the new town of Sundyberg in Sweden in 1967. Basically, refuse can be thrown in a chute where it drops into a valve room. The valve is periodically opened so that collected garbage can fall into a horizontal tube where it is sucked as in a vacuum cleaner to a central facility. The cost of such a system is apparently greater than traditional garbage removal.

Some thinking has also been done recently on the pipeline transport of solids by means of a slurry or sealed packages. Again, the technique is most likely feasible but the critical considerations for success of such a system are other than technical.

Economics and logistics dictate that an externally controlled system should be a collection from many locations to a central facility or delivery from a central facility to many locations. Consolidation terminals and central shipping and receiving areas go a long way towards this. At this early stage, it seems that many to one may be easier to institute than one to many.

4.2.5 New Methods of Freight Handling

One of the greatest needs for improvement today is in the area of goods handling - the process of preparing goods for shipment, transferring between modes and delivering the shipment to its ultimate destination. Basically, it is suggested that the labour involvement must be reduced regardless of whether the modes of transport are traditional or innovative. Among the possible improvements are common palletization, standard size containers and increased automation of terminals and storage areas.

4.3 COMMUNITY PLANNING

4.3.1 Allocation of Land Use

The land use allocation process is subject to a multitude of considerations of which urban goods movement is only one. However, it is suggested that the relationship between heavy generators of freight and the transport system be recognized during the planning stage to reduce the possibility of conflict of goods movement through residential areas.

In general, heavy industry should be located adjacent to trunk transport services such as railways, pipelines and freeways and light industry should be located close to freeways and arterials. Light industry is also ideally used as buffers between incompatible land uses. It is suggested therefore that corridors of this type of development could be planned adjacent to the future Provincial Highways, including Highway No. 407, the East Metro Freeway and possible airport access highways. There are also obvious considerations such as locating air freight related facilities (e.g.mail

terminals) near the airport. Similarly, many manufacturing plants which use raw materials must have access to at least a spur line to the railway network.

A significant amount of intercity goods shipping will probably still be by truck. Terminals for these trucks should be located on flat, well drained land with easy access to intercity highways. Because of possible negative environmental impacts they should be located on the outskirts of urban areas or separated from residential areas. It is beneficial to locate these terminals in close proximity of each other to reduce the cost of interline transfers. The terminal areas should be large enough to include such facilities as offices, garages and warehouses. The increasing size of trucks implies that terminal areas should be sufficiently large to accommodate these vehicles and the space they need for parking and manoeuvering.

Trailer-on-flat-car operations or "piggybacking" have been increasing in recent years for long haul freight movements. Terminals for this type of transport should be on railway lines and also be adjacent to good road facilities.

4.3.2 The Transportation System

The transportation system in North Pickering will have to satisfy a variety of goods movement demands. The road system, in particular, should consist of a balanced and integrated network of freeways and arterials. In this way, a variety of trip purposes and trip lengths can be accommodated.

In the core commercial areas, trucking desirably should be separated from person pedestrian and automobile travel. This could be done at-grade but it seems more likely that the separation should be vertical The spacing between parallel underground truck routes should be such that each central receiving area can be directly served.

Through truck routes with heavy truck traffic should not pass through residential areas. However, light trucks typically utilized for local deliveries do not appear to present a significant problem now or in the future.

Corridors should be reserved for future goods movement facilities. If new technology is not immediately forthcoming, the corridors can be utilized by traditional modes. These corridors should join major industrial areas and distribution centres. It is advisable that a north-south corridor between Metropolitan Toronto and the new airport be reserved. In many instances, it should be possible to incorporate these plans into freeway right-of-ways.

The new town is to be situated between a major metropolis, Toronto to the southwest and an extensive new airport directly to the north. There is every indication that goods movement by the air mode will increase disproportionate to other modes. Similarly, a high interchange of all activity including goods movement will in all probability occur between the new town and Metroplitan Toronto. Therefore, particular consideration should be given during the planning stage to the movement of goods between the new town and the airport, between the new town and Metropolitan Toronto, and between Metropolitan Toronto and the airport.

Distribution of air freight is predominantly carried out by trucking since the type of shipments transported by air are not suitable for final distribution by other modes. Therefore, freeway type facilities should be provided to the airport to satisfy freight movement demands. However, the existence of a rail line near the airport should be noted. Special consideration should be given to its incorporation in the goods movement network.

4.3.3 Town Centre Considerations

Any development of significant size should have a central shipping and receiving area for small packages. However, truckload and large shipments such as furniture need not necessarily be routed through this facility. Direct access designed for large trucks is necessary from the road system to the central facility and to large freight generators.

The provision of transportation and goods movement facilities should not detract from the attractiveness of the Town Centre. The facilities should include a central receiving area for small shipments and the truck routes and loading and unloading areas should be separated from pedestrian movements.

4.4 INCREASING EFFICIENCY THROUGH CONSOLIDATION

It is suggested that in many instances, there should be a hierarchy of three stages in goods movement. Firstly, intercity movements should be sent from and received at major terminals where various types of shipments can be consolidated. Next, there should be a single agency engaged in local pick-up and delivery between a consolidation terminal and central shipping and receiving areas for large developments or groups of buildings. This agency should control all intracity goods movement as well. Finally, goods should be separated in the central shipping and receiving areas and forwarded to their ultimate destinations. In this way, suitable means of transport could be used for each relative type of trip. In shipments of bulk materials and other goods, consolidation is now feasible. Perishable goods distribution is an obvious example where direct shipping is necessary. Typically, consolidation should be done for manufactured goods shipped in small and numerous pieces. The goods handling involved in consolidating shipments in this manner may be increased, however, technical

improvements in this area are expected. A conceptual sketch of the proposed system is shown in Diagram 1.

4.4.1 Consolidation Terminal

The duplication of urban pick-up and delivery can be eliminated in large measures by consolidated shipments in the urban areas and by having a single operating agency.

Today many firms operate overlapping services at less than peak efficiency. Consolidation will increase the average truck-load factor and hence also decrease the number of disruptive delivery stops and the receiving facilities needed. The single service to and from the consolidation terminal should also operate the purely intracity freight movements. Moreover, the agency should take over present-day private general delivery trucking as well as "for hire" for increased efficiency and economies of scale.

4.4.2 Central Shipping and Receiving Areas

A central shipping and receiving area is necessary for any major large scale development and should also be organized for groups of adjacent smaller scale buildings. In a new town these facilities could also serve sub-activity centres and residential neighbourhoods. It is envisaged that a small number (2-10) of shipping and receiving areas would be established in the core business areas. This type of facility would eliminate the costly numerous deliveries of small items to a single destination.

The central shipping and receiving area would collect all incoming and outgoing articles for more efficient goods movement. The final distribution of goods from such a facility to the

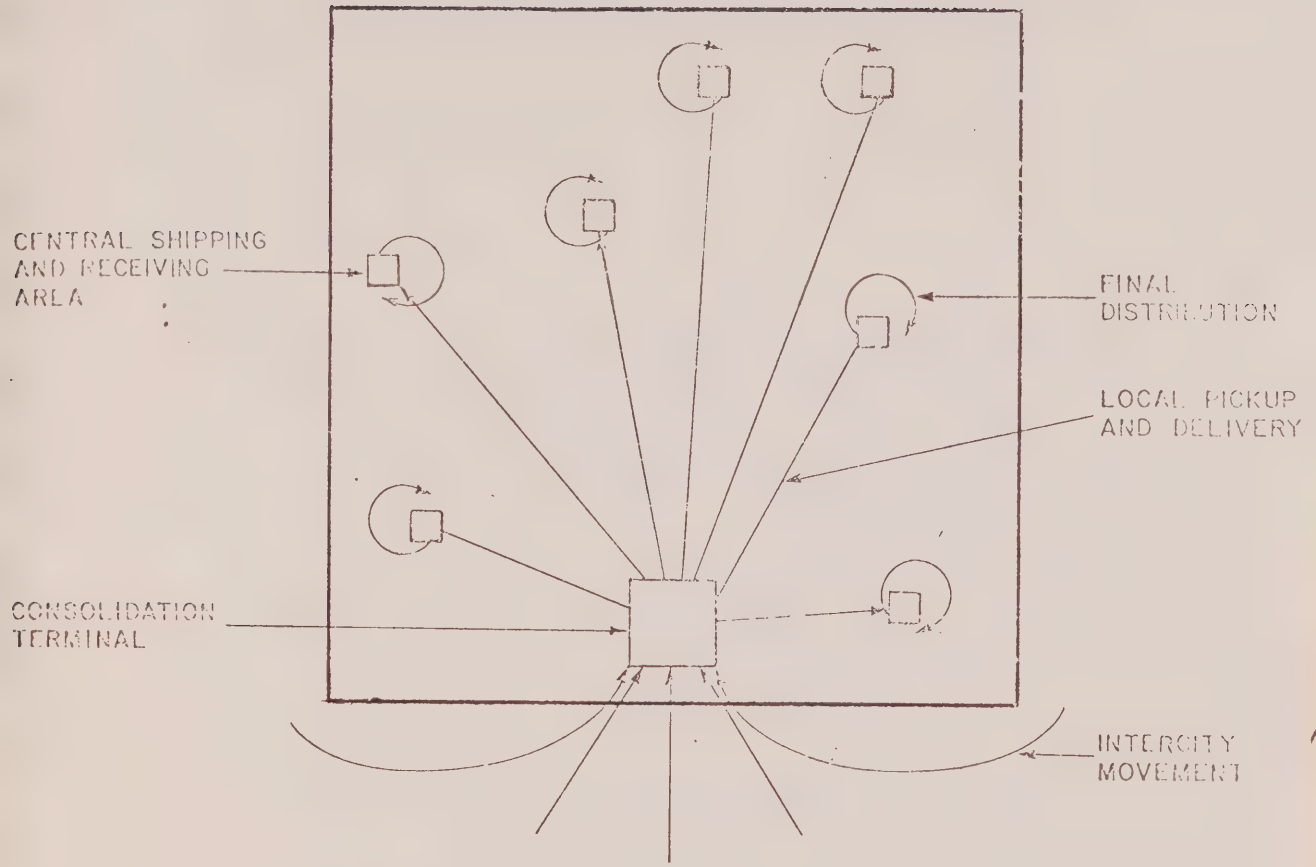

Diagram I

CONCEPTUAL SKETCH OF THREE STAGE URBAN GOODS MOVEMENT PLAN

ultimate destinations could perhaps be done through improved techniques. This phase of goods movement should again utilize the required scale of operations whereas today many deliveries of this type are made with vehicles more suitable for relatively larger scale operations.

4.5 REGULATION

4.5.1 Local By-laws

Laws or by-laws are required to establish a single agency to control all small goods shipments now done by both the "for hire" and private trucking modes. This agency should operate the consolidation terminal as well and should have strong powers over the establishment, design and operation of central shipping and receiving areas. The urban goods movement organization can be set up as an operating agency directly under the control of the municipal government or can be operated by a private firm strongly regulated by the local government. The latter option is probably most favoured.

Present local by-laws in Ontario communities do not stipulate a sufficient number of truck loading and unloading bays (5,6).

A recent study (7) has summarized the present by-laws of Canadian towns and cities with regard to these facilities. Although the requirements varied greatly by municipality, the following gives an indication of present-day typical requirements:

1 space for up to 20,000 square feet
2 spaces for 20,000 to 50,000 square feet
3 spaces for 50,000 to 100,000 square feet
1 additional space per 50,000 square feet

other sources (6) suggest revised minimum requirements.

Although truck space requirements do vary by land-use type, little is known at present.

Dimensions of truck stalls for general pick-up and delivery should be 30 feet by 12 feet with 12-foot vertical clearance and for tractor trailer units, should be 14 feet by 60 feet with 15 feet vertical clearance. For both types of trucks, a manoeuvering apron equal in length to the length of the stall should also be provided. Truck parking facilities should also be provided when the number of stalls is larger than about three. Typically, driveways for trucks should be 30 to 40 feet in width and should be designed with minimum curve radii of about 20 to 25 feet.

Office developments also attract a large number of light truck trips. Facilities such as off-street driving ramps should be provided specifically for this type of delivery.

4.5.2 Legislation

Present Provincial legislation allows for municipal control over the routing and timing of any trucks greater than 50 feet in length (8). This means that a majority of large and possibly disturbing trucks cannot be controlled. It is recommended that this legislation be altered such that municipalities have more control over a larger number of trucks.

4.6 OTHER CONSIDERATIONS

The procedure of making nighttime deliveries to retail and other establishments in core areas has been suggested. During a 6-month trial of nighttime deliveries in London, England, it was found that the technique was more costly for both the shipper and the consignee. It is thought that with strategically located central shipping and receiving areas and that with the operation of urban goods movement conducted by a central agency, nighttime deliveries will be feasible in North Pickering.

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